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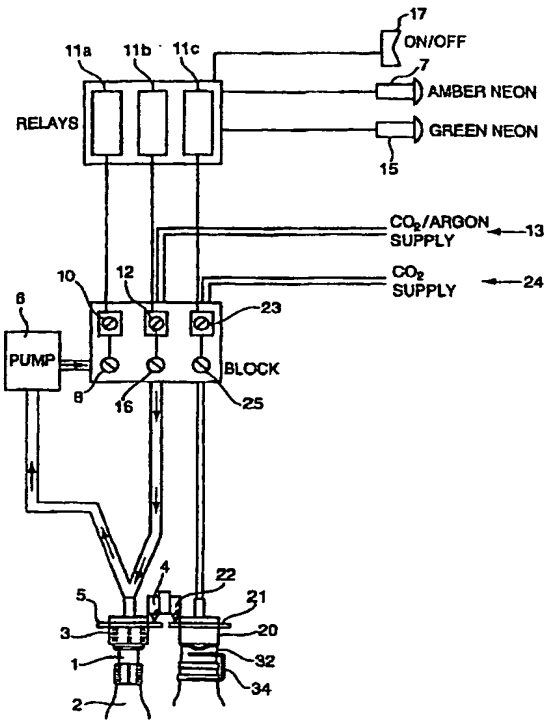
(54) Title: METHOD AND APPARATUS FOR PRESERVING THE CONTENTS OF BEVERAGE CONTAINERS



(57) Abstract: This invention provides a method of and an apparatus for preservation of the contents of a part filled beverage container, such as an opened wine bottle (2). The method comprises the steps of removing gas from the container (2) until a first predetermined pressure is achieved; and supplying an inert gas to the container until a second predetermined pressure is achieved. To preserve the contents of a sparkling wine bottle, it is possible to supply a pressurising gas to the container until a third predetermined pressure is reached.

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European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declaration under Rule 4.17:

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METHOD AND APPARATUS FOR PRESERVING THE CONTENTS OF BEVERAGE CONTAINERS

This invention relates to preservation of the contents of beverage containers, in particular to preserving the contents of still and sparkling wine bottles once some of the wine has been removed. However, the invention can equally well be used with other beverages and other type of containers, for example wine barrels.

It is known to preserve still wine in wine bottles by evacuating the air space above the liquid once some of the wine has been consumed. It is also known to preserve sparkling wine in wine bottles by pumping air or carbon dioxide into the bottle to prevent the wine from losing its sparkle.

However, a problem with such known systems is that the residual air (and hence oxygen) in the bottle allows some oxidation of the contents to occur. Furthermore, some beverages may deteriorate if kept at a sub atmospheric pressure for a sufficient length of time.

This invention seeks to reduce the amount of residual oxygen in a beverage container in order to increase the length of time for which a preserved beverage may be stored, and seeks to avoid the need to store a beverage at a sub atmospheric pressure.

In its broadest aspect, the invention provides apparatus

for preserving the contents of a part filled container, the apparatus comprising a stopper with a bi-directional valve, adapted to be removably fitted in an aperture of the container; means for extracting a gas from the container, through the valve in the stopper; and means for introducing a gas into the container, through the valve in the stopper.

The invention also provides an apparatus for preserving the contents of a part filled container, the apparatus comprising a bi-directional valved stopper, adapted to be removably fitted in an aperture of the container; a vacuum source communicating with a socket of the apparatus via a first pneumatic circuit, the socket being adapted to form a seal with the stopper, the vacuum source being arranged, in operation, to remove gas from the container via the stopper to create a sub atmospheric pressure inside the container; means for disconnecting the vacuum source once a first predetermined pressure has been achieved inside the container; an inert gas source communicating with the socket via a second pneumatic circuit, the inert gas source being arranged to supply inert gas into the container via the stopper once the vacuum source has been disconnected; and means for ceasing the supply of inert gas once a second predetermined pressure has been achieved inside the container.

The vacuum source is preferably a vacuum pump, and the means for disconnecting the vacuum source may comprise a switch which switches off and stops operation of the pump.

By replacing air, and its oxygen content with an inert gas in a part filled container it is possible to slow the rate of oxidation and hence deterioration of the contents. As the percentage of oxygen in air is known (approximately 18%) and the percentage of remaining air/gas at the first predetermined pressure is known, it is possible to quantify the residual oxygen content after a cycle of removal of gas followed by supply of the inert gas. Two or more cycles may be completed in order to further dilute the residual oxygen content and therefore further increase the possible period of preservation. Alternatively the level of vacuum (ie the first predetermined pressure) may be increased with the same result.

In the preferred embodiment of the invention the bi-directional valved stopper is a stopper incorporating a flutter valve. The flutter valve is preferably arranged, once a cycle is complete, to retain a small residual pressure differential between the atmosphere inside the container and the ambient atmosphere outside.

In the case of still beverages, the pressure inside the bottle will be slightly superatmospheric, so that the slight residual pressure prevents the ingress of air if the container (for example a bottle) is cooled or refrigerated. In other embodiments the stopper could incorporate two non return valves which operate to prevent flow in different directions, for example.

For the preservation of sparkling beverages it is desirable to apply a superatmospheric pressure to the part filled container in order to prevent the beverage from losing its sparkle. This can be done after replacing air and its oxygen content with an inert gas, thus ensuring that the beverage neither oxidises nor loses its effervescence.

Therefore, for preservation of sparkling beverages the apparatus further comprises a second gas source communicating with a socket, the second gas source being arranged, in operation, to supply gas into the container via the stopper; and means for ceasing the supply of the gas once a third predetermined pressure is reached.

It would be possible for the two operations, i.e. the replacement of residual oxygen by an inert gas, and the application of a head pressure to be carried out via the same socket. However, for ease of use by bar staff, in the preferred embodiment there are two sockets one for the replacement of residual oxygen by an inert gas, and a second for the application of a head pressure from a second gas source.

Before offering a sparkling beverage container to the socket for application of the head pressure it is preferable if a second stopper (designed to fit snugly over the first stopper) is fitted. The second stopper has a retention device to stop it from being blown apart from the first stopper, and a non return valve to allow the

head pressure to be applied and retained.

Argon is a preferred inert gas, because argon is particularly effective for inhibiting the evaporation of any dissolved oxygen present in a liquid in the part filled container. Carbon dioxide is preferred as the gas for creating the head pressure. It would also be possible to use carbon dioxide as the inert gas so that only a single gas supply is required.

Preferably, the means for stopping the pump from pumping through the valve is also arranged to activate the supply of inert gas. The means for stopping the pump from pumping through the valve and for ceasing the supply of the inert gas or the head pressure gas are conveniently implemented by the use of pressure sensitive switches located in the appropriate pneumatic circuit, and arranged to operate once the appropriate sub atmospheric or super atmospheric pressure is reached.

Such switches may be arranged to actually stop the pump or supply or they may be arranged to close a valve in the appropriate pneumatic circuit, or both.

Part of the or each socket can be spring loaded relative to a switch which starts the pump operation or the supply of the second gas so that the socket can be displaced by offering the container to the socket, causing the switch to operate.

According to a second aspect of the invention there is also provided a method for the preservation of the contents of a part filled beverage container, comprising the steps of removing gas from the container until a first predetermined pressure is achieved; and supplying an inert gas to the container until a second predetermined pressure is achieved.

The above steps may be performed a number of times in order to repeatedly dilute the amount of residual oxygen remaining in the part filled beverage container.

This method may be used for the preservation of sparkling beverages by including the further step of supplying a gas under pressure to the container until a third predetermined pressure is reached.

According to another aspect of the invention, there is provided a stopper for a wine bottle, the stopper having a skirt to seal against the neck of a wine bottle and a bi-directional valve which can open to allow flow through the stopper in either direction when a pressure differential above a threshold level is applied in either direction across the stopper, and which remains closed when a pressure differential below said threshold is applied.

The bi-directional valve is preferably a flutter valve and the stopper is preferably a one-piece moulded product of an elastomer material, with the lips of the flutter valve being integral with the stopper.

The invention is particularly intended for and adapted to the preservation of wine contained in conventional glass bottles, and may be installed behind a bar where a selection of wines is available for sale. It is simple for a bar tender to dispense one glassful from a part-consumed bottle, to insert the stopper and offer the bottle up to the apparatus so that the air in the headspace, and its oxygen content, can be evacuated from the bottle.

Stoppers may be used which are colour coded to indicate the ideal frequency for the replacement of residual oxygen by an inert gas to be performed, in dependence upon the expected turnover of the particular product. For example, black may indicate a fast moving product which requires the operation to be performed once at the end of service. Silver may indicate a product which requires the operation to be performed once after each glass of wine is served, and gold may be used to indicate a product which requires the operation to be performed twice after each glass of wine is served.

Embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings in which

- Figure 1 illustrates an apparatus according to the present invention;

Figure 2 illustrates a stopper for use in the present

invention; and

Figure 3 illustrates a retaining device for use with the present invention.

Figure 1 illustrates a schematic view of one embodiment of the present invention. The apparatus is set to a ready condition using a switch 17. A wine bottle 2, from which a glass of wine has been dispensed, is closed with a reusable bi-directionally valved stopper 1 which is inserted into the mouth of the bottle 2. The bottle and stopper are then offered up to a socket 3. The socket is connected to a strike plate 5 for operating a switch 4. The strike plate 5 is biased such that a switch 4 is usually in the off position. Upward pressure on the strike plate 5 triggers the switch 4, which causes a vacuum pump 6 to operate and an amber neon bulb 7 to be illuminated. The vacuum pump 6 serves to withdraw air from the headspace of the part filled bottle 2 through the stopper 1 via a first pneumatic circuit.

The stopper 1 incorporates a flutter valve (see Figure 2). This valve will retain a small pressure differential between its two sides (eg 0.1 - 0.15 bar), irrespective of which side is at a higher pressure and which side is at a lower pressure. The valve will however open to allow flow from one side to the other when a pressure differential above a certain level is applied across the valve.

A pressure sensor 8 is arranged to detect a first

predetermined pressure, which is a subatmospheric pressure. Once this first predetermined pressure is achieved and detected by the sensor 8 a solenoid valve 10 is caused to operate to close the first pneumatic circuit. Relays 11a, 11b, 11c serve to turn off the pump 6 and to open a second solenoid valve 12 in a second pneumatic circuit. Argon is supplied from a remote source 13 (not shown) via the socket 3 and the stopper 1. In this embodiment of the invention argon is pumped through the second pneumatic circuit, although it would be possible to allow the argon to be drawn through the circuit by the pressure differential which has been created.

A second pressure sensor 16 is arranged to detect when a second predetermined pressure has been achieved. This second predetermined pressure is just above atmospheric pressure, for example 1.1 to 1.2 bar. Once the second predetermined pressure is achieved the relays 11a, 11b, 11c serve to close the solenoid valve 12, which closes the second pneumatic circuit and cuts off the supply of argon. The amber neon bulb 7 then goes out and a green neon bulb 15 lights up to indicate operation complete.

In the event that the supply of argon is exhausted the second pressure sensor 16 does not operate and the green neon bulb 15 does not light up. The operator will then know that the operation has not been properly completed.

Removing the bottle 2 causes the switch 4 to return to the off position. The green neon bulb 15 goes out and the

apparatus is reset and ready for the next operation.

When the stopper is removed to allow more of the container contents to be dispensed, there will be a small rush of gas out of the container.

The flutter valve 31 (Figure 2) is preferably arranged to open inwardly at pressures of 1 ± 0.15 bar and outwardly at $\leq$ 1 bar.

Figure 3 illustrates a second stopper 32 which is adapted to fit snugly over the bi-directionally valved stopper 3. The second stopper 32 has a non return valve 33 and a retaining clip 34 which is designed to engage under the neck 35 of a bottle 2.

This stopper is to be used in a second operation to be carried out for the preservation of sparkling wines, which will now be described with reference once more to Figure 1.

The stopper 32 is secured over the bi-directionally valved stopper 3. The bottle and stopper are offered up to a second socket 20, which utilises a strike plate 21 and a switch 22 in a similar manner to that described previously.

Activating the switch 22 causes the relays 11a, 11b, 11c, to open a solenoid valve 23 allowing carbon dioxide to be supplied via the socket 20 and the stoppers 3, 32. The

amber neon bulb 7 lights up. Carbon dioxide is supplied from a remote source 24 (not shown) and is pumped into the bottle 2, via a third pneumatic circuit until a third pressure sensor 25 detects that a third predetermined pressure has been achieved.

Once the third predetermined pressure is achieved the relays 11a, 11b, 11c, serve to close the solenoid valve 23, closing the third pneumatic circuit and cutting of the supply of carbon dioxide. The amber neon bulb 7 goes out and the green neon bulb 15 lights up.

Similarly to the previous case, in the event that the supply of carbon dioxide is exhausted the pressure sensor 25 does not operate and the green neon bulb 15 does not light up.

Removing the bottle 2 causes the switch 22 to return to the off position. The green neon bulb 15 goes out and the apparatus is reset.

1. Apparatus for preserving the contents of a part filled container, the apparatus comprising

a stopper with a bi-directional valve, adapted to be removably fitted in an aperture of the container;

means for extracting a gas from the container, through the valve in the stopper; and

means for introducing a gas into the container, through the valve in the stopper.

2. Apparatus for preserving the contents of a part filled container, the apparatus comprising

a bi-directional valved stopper, adapted to be removably fitted in an aperture of the container;

a vacuum source communicating with a socket of the apparatus via a first pneumatic circuit, the socket being adapted to form a seal with the stopper, the vacuum source being arranged, in operation, to remove gas from the container via the stopper to create a sub atmospheric pressure inside the container;

means for disconnecting the vacuum source once a first predetermined pressure has been achieved inside the container;

an inert gas source communicating with the socket via a second pneumatic circuit, the inert gas source being arranged to supply inert gas into the container via the stopper once the vacuum source has been disconnected; and

means for ceasing the supply of inert gas once a second predetermined pressure has been achieved inside the

container.

3. Apparatus as claimed in Claim 2, wherein the vacuum source is a vacuum pump, and the means for disconnecting the vacuum source comprises a switch which switches off and stops operation of the pump.

4. Apparatus according to Claim 2 or Claim 3, in which the bi-directional valved stopper is a stopper incorporating a flutter valve.

5. Apparatus according to any one of Claims 2 to 4, further comprising

a second gas source communicating with a socket, the second gas source being arranged, in operation, to supply a second gas into the container via the stopper; and

means for ceasing the supply of the second gas once a third predetermined pressure is reached.

6. Apparatus according to Claim 5, further comprising a second stopper adapted to fit over the bi-directional valved stopper, the second stopper having a non return valve and a retention device.

7. Apparatus according to any one of Claims 2 to 6, in which the inert gas is argon.

8. Apparatus according to any one of Claims 2 to 7, in which the means for stopping the pump is arranged to activate the supply of inert gas.

9. Apparatus according to any one of Claims 2 to 8, further comprising a switch biased in the off position by a spring which is in communication with a socket and in which the socket can be displaced against the action of the spring by introduction of the container having the stopper fitted in an aperture, and wherein the displacement of the socket operates the switch to start the pump pumping through the valve.

10. Apparatus according to any one of Claims 2 to 9, further comprising a switch biased in the off position by a spring which is in communication with a socket and in which the socket can be displaced against the action of the spring by introduction of the container having the stopper fitted in an aperture, and wherein the displacement of the socket operates the switch to start the supply of the second gas.

11. A method for the preservation of the contents of a part filled beverage container, comprising the steps of

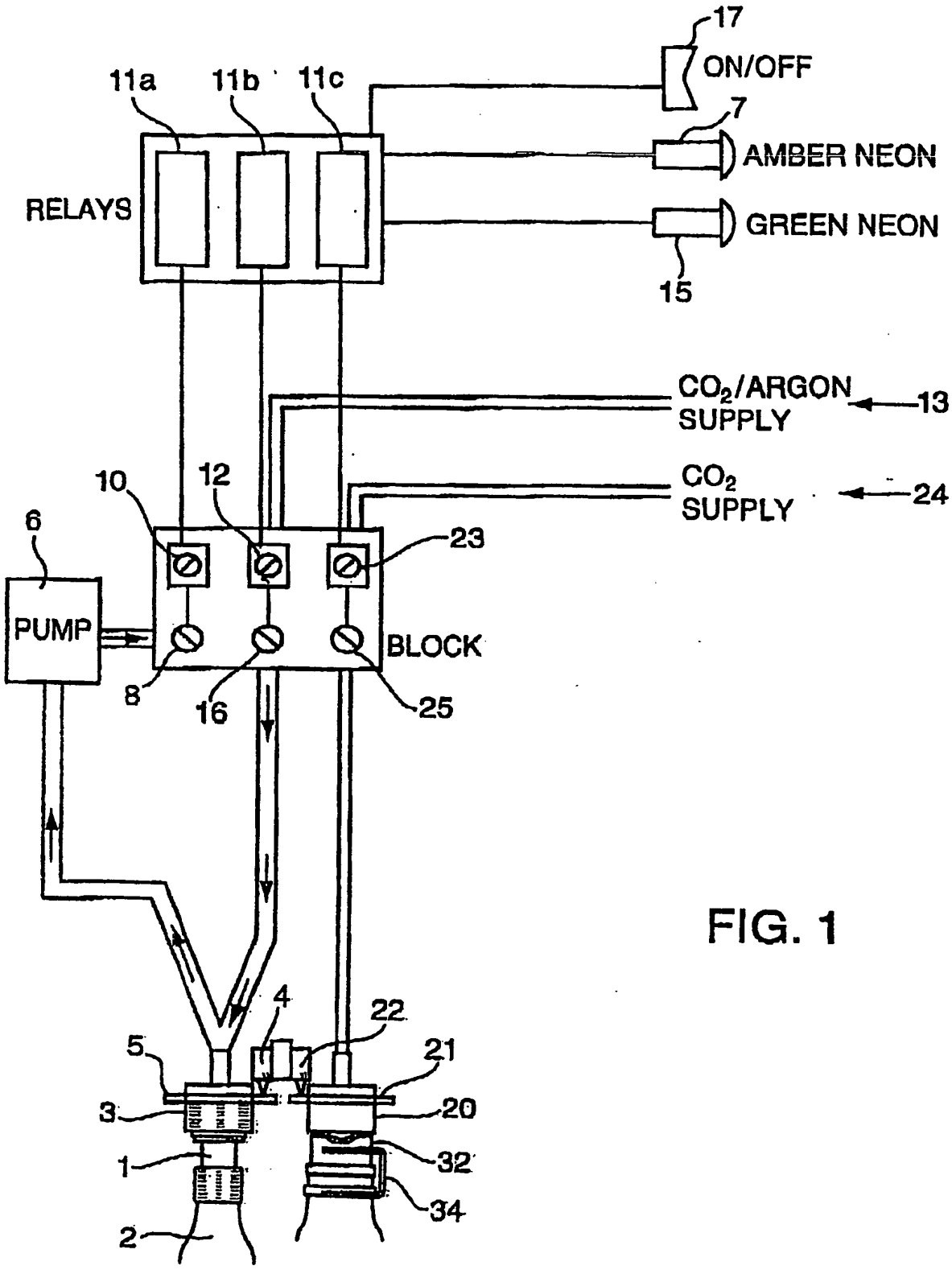
removing gas from the container until a first predetermined pressure is achieved; and

supplying an inert gas to the container until a second predetermined pressure is achieved.

12. A method according to Claim 11, further comprising the step of supplying a second gas to the container until a third predetermined pressure is reached.

13. A stopper for a wine bottle, the stopper having a skirt to seal against the neck of a wine bottle and a bi-directional valve which can open to allow flow through the stopper in either direction when a pressure differential above a threshold level is applied in either direction across the stopper, and which remains closed when a pressure differential below said threshold is applied.

14. A stopper as claimed in Claim 13, wherein the bi-directional valve is a flutter valve.


17
ON/OFF
11a
11b
11c
7
AMBER NEON
RELAYS
GREEN NEON
15
CO_2/ARGON SUPPLY
13
CO_2 SUPPLY
24
10
12
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3
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1
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34
2

FIG. 1

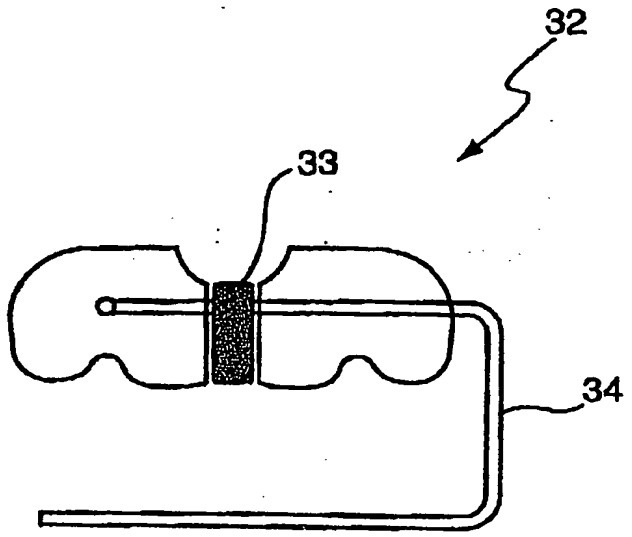

FIG. 3

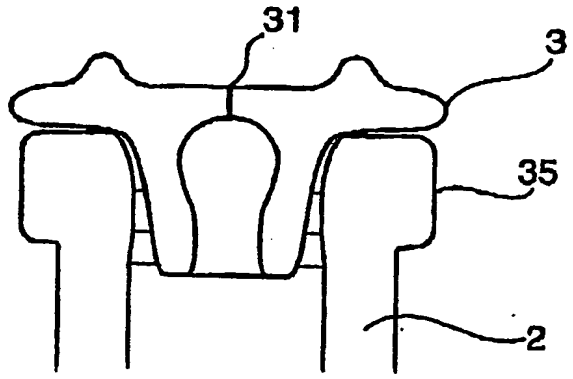

FIG. 2

INTERNATIONAL SEARCH REPORT

PCT/GB 03/03757

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 C12H1/16

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 C12H C12L B67C B67D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ, FSTA, BIOSIS, COMPENDEX

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DATABASE WPI Section PQ, Week 200221 Derwent Publications Ltd., London, GB; Class P28, AN 2002-159964 XP002260002 & JP 2001 354206 A (SANDEN CORP), 25 December 2001 (2001-12-25)	1,2
A	abstract	3-14
A	FR 2 526 762 A (VERON PIERRE) 18 November 1983 (1983-11-18) claim 1; figures	1-14
A	US 4 475 576 A (SIMON PHILIP E) 9 October 1984 (1984-10-09) the whole document	1-14

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
16 December 2003	02/01/2004

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax (+31-70) 340-3016	Koch, J

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INTERNATIONAL SEARCH REPORT

PCT/GB 03/03757

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	FR 2 601 962 A (COUESMES SERGE) 29 January 1988 (1988-01-29) the whole document	1-14
A	FR 2 819 687 A (ERNEWEIN JEAN MICHEL) 26 July 2002 (2002-07-26) abstract; figures	1-14
A	DE 37 42 433 A (NAGEMA VEB K) 7 July 1988 (1988-07-07) abstract	1-12

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

PCT/GB 03/03757

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2001354206 A	25-12-2001	NONE	
FR 2526762 A	18-11-1983	FR 2526762 A1	18-11-1983
US 4475576 A	09-10-1984	NONE	
FR 2601962 A	29-01-1988	FR 2601962 A1	29-01-1988
FR 2819687 A	26-07-2002	FR 2819687 A1 WO 02059036 A1	26-07-2002 01-08-2002
DE 3742433 A	07-07-1988	DD 256315 A1 DE 3742433 A1	04-05-1988 07-07-1988